RAILWAY ENGINEERING
and Maintenance of Way

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THESE are busy days for the South Side Elevated Ry at Chicago. The company is in the throes of installing express service which is being done by the addition of a third track which will run from 43rd street to 12th street. It is quite a feat to accomplish this work without materially disturbing the traffic. What with the shifting of platforms, the erection of substructure and the laying of the tracks the "L" presents a rather busy appearance. The work was to have been finished some time ago but until just recently has been tied up by labor strike. This express service has been greatly needed on the South Side and will no doubt be used to its capacity.

THE tourist road up the side of Mount Vesuvius is one of the curiosities of the world in the means taken to overcome gravity. No less than three schemes of traction are involved in taking the passenger from the city of Naples to the crater. First comes the ordinary electric street car, and next is a rack road up the mountain, after which traction is changed to the adhesion type, which is again replaced by the cable system for the last stage of the ascent.

The whole system may properly be called electric, since the power is practically all generated at a point near sea level, by gas engines developing a direct current. The grades of the rack road are about 25 per cent, while the rise of the adhesion line does not exceed 8 per cent. The resistance to be overcome by adhesion is however, higher than any operated by that means elsewhere, being 160 pounds per ton for the grade alone.

If there ever was a railroad that presented any greater difficulties, or a more diverse series of methods to overcome gravity than that up Vesuvius, the particulars are not of record. The original cost was not so much in excess of ordinary construction as to excite comment, but the maintenance cost assumes an apalling figure after an eruption like that just passed through.

MEXICO has a new railroad which runs across the rather unpronounceable Isthmus of Tehuantepec. It is calculated to bring New York 1,200 miles by sea nearer San Francisco than the Panama Route and if it can be operated successfully may cause some trouble with the transcontinental lines here in the United States. The road itself has been completed some time and is in operation for local traffic and by the end of the year through the completion of the wharves and terminals will be ready for interoceanic traffic.

This railway lies 600 miles north of the present Panama route and is of course that much nearer the natural line of the world's east and west commerce. The sailing time from New York to Coatzacoalcos, the Atlantic terminal, will be six or seven days, two days less than to Colon, the Atlantic port of the Panama route. A vessel landing its cargo at Coatzacoalcos, say of 10,000 tons, in the fore part of the week can be released and the cargo on another vessel at Salina Cruz the latter part of the week. It is claimed that in case of an emergency this could be delivered to the Pacific coast terminal just mentioned, in thirty-six hours.

Such a railroad has had a great many efforts on the part of Americans for its completion in the past half-century, but they have all been more or less unsuccessful. The Tehuantepec route has been much discussed in the United States in connection with the Panama and Nicaragua routes. About the middle of the last century is was proposed that the United States build a railroad across the Isthmus of Tehuantepec for international use, assuming control over and guaranteeing the neutrality of a strip of land on either side of it. Mexico was willing, but two treaties failed to obtain the approval of the American Senate and the matter was dropped The road has been finally built by Sir Weetman Pearson, the English contractor at the expense of the Mexican government and is to be operated by the contractor in partnership with the government for a long term of years.

The total cost of the 190 miles of its length, together with the harbor and port terminals and port improvements at its terminals, which are the main items, will be approximately $25,000,000.

In the actual track work, the Tehuantepec road has been constructed in what is generally called a "perma-

nent" way. The roadbed being rock ballasted, heavy creosoted ties in place, heavy rails, strong steel bridges and unusually heavy masonry supports should be in first class shape for many years, but railroad track work in the tropics is always of an uncertain nature. The opening of the road for interoceanic traffic which will be closely watched by a great many interests.

Chicago Freight Subway.

CHICAGO'S "Freight Subway" is a thing of mystery, in fact the work has been carried on so quietly in the last five years that few people even in Chicago know of its existence. The major part of the business section includes an area of only 1¼ sq. miles which is surrounded on three sides by the lake and rivers, and an idea may be gained of highly congested conditions when it is known that the district includes only nine north-and-south streets and eleven east-and-west streets.

Transfer and teaming work is consequently very slow and at the same time expensive. The railway freight houses being scattered adds more to the trouble. The idea of carrying freight under ground is practically original with the scheme as understaken in this city, New York, Boston, London and other large cities have their subways but they carry no freight of any quantity. It is obvious to one acquainted with the conditions in Chicago, that when the large heavily laden moving trucks and vans used in freight transferrng, can be dispensed with in the streets the congestion of the passenger traffic will be greatly relieved. To have a big heavy truck loaded six or eight feet high with freight, block up a long line of street cars on many of the streets is such a common every day occurrence that no one gives it a moment's thought.

The engineering features involved in putting the bore through have been many and varied, while the work has not required the blasting and dynamiting that the New York subway required, the problems otherwise have been fully as great.

Connections up to date have been made with all passenger terminals, but one and the general postoffice for the express purpose of carrying the government mails, for which the subway company has already secured a contract. Among other things that the subway company is expecting to handle are: carriage of merchandise between freight houses and mercantile establishments, connections having already been made to a large number of business houses and connections will be made where requested and a minimum of 50 tons of freight a day is guaranteed; the transfer between railroad freight houses of less-than-carload freight not too bulky to be loaded into cars of 15 ton capacity and 2 ft gage; delivery of coal to office builldings, stores, hotels, etc., and removal of ashes from same, transmission of newspapers, mail matter, packages and parcels; removal of material from excavations on building sites and debris from old buildngs being demolished.

The subway will no doubt have all the business it can handle, as it competes with teaming transportation its prices will probably be rated to that effect. Its benefits to the railroads running into Chicago is evidenced by the fact that almost the entire personnel of the board of directors is made up of the highest railroad officials. The amount of business that the subway can handle will be too hard to even give an estimate, but there is no doubt that it will be worked to its fullest capacity.

The Brooklyn Bridge Problem.

A PROPOSITION, which is somewhat novel but entirely feasible, is the following solution of the congested traffic over Brooklyn Bridge problem. Some figures on the traffic will be helpful to more clearly understand the situation. In 1883 there were some 8½ million passengers, this has increased to the enormous amount of 130 million passengers recorded in 1904. Today 356,000 passengers cross the bridge daily, 190,000 coming to Manhattan in the morning and 166,000 returning to Brooklyn at night, the remaining 24,000 preferring to return by other routes.

The need at the present time is for an immediate improvement if it can be secured by a method of transportation which offers a higher degree of efficiency without increasing the strain on the brige structure.

The suggestion is to place a "continuous train" in the positon where the elevated cars are now operating and to run this train at a constant speed of 10 or 12 miles per hour. At either terminal there is to be provided a series of moving platforms operating independently and at differential speeds. This is to be so arranged that a person can board or leave the continuous train without it having to be stopped.

From the great success of the moving platforms at the World's Columbian Exposition at Chicago and also that of the Paris Exposition, where some 7,000,000 passengers were carried without a single interruption of traffic or serious accident, there is little doubt as to the practicability of the scheme. As early as 1894 Messrs. Thomas C. Clark and John Bogart, two well known New York Civil Engineers, submitted a plan for a Moving Platform installation on the Brooklyn Bridge.

In the report or argument on the problem submitted by Mr. Max E. Schmidt to the Commission of Bridges, he gives the following advantages that may be derived from the use of the "Continuous Train."

"An equipment which will be lighter and more uniform in weight than the train equipment and therefore cause less stresses on the bridge cables and less depreciation of the bridge members.

"An equipment which will carry the people away faster than they can come to it—which will have seats for all who wish to be accommodated and still have seats to spare.

"An equipment on which there will be no crowding on the train or at the terminals, which will afford a complete and permanent relief of the disgraceful conditions now existing in Manhattan at night and at the same time effectively remove the cause of the delays at the Brooklyn end of the bridge.

"An equipment which will move noiselessly and without jar and on which passengers cannot be knocked down by cars or have their legs cut off by wheels; on which there is no switching or obstructing of tracks, and on which collisions are made impossible."

Whatever the outcome it is certain that New York must do something to remedy this congestion and in the very near future.

The Pennsylvania Railroads Extension to New York and Long Island.

The Passenger Station in New York.

THE new Pennsylvania Railroad station in New York, for which the plans are now practically perfected, will be unique among all the railway stations of the world in the number and convenience of its entrances and exits. This condition is due to the fact that each of the four sides of the structure is a front, opening respectively on two wide avenues and two important streets, which latter have been widened by the Company to 80 feet each.

The geography of the station is interesting. It is bounded on the east by Seventh and the west by Eighth Avenue; on the south by Thirty-first and the north by Thirty-third Street, Thirty-second street having been closed and included in the station site. In the centre of the hotel, theatre and shopping district the advantage of its location is obvious. The frontage on the avenues is 430 feet and on the streets 780 feet, the sides of the structure forming a perfect parallelogram. As the tracks are 40 feet below the surface of the streets the station is divided into three levels. From the street level upward the walls of the structure rise to the height of 60 feet, except in the centre, where the roof of the general waiting room reaches a height of 150 feet and the corner of Eighth Avenue and Thirty-third Street where there is an elevation of four stories for office purposes. The architectural design of the entire exterior is a Doric colonnade, thirty-five feet high, surmounted by a low attic, raising the general elevation to 60 feet. The unusual extent of the building in area and its general type are suggestive of the great baths of ancient Rome. In fact, the baths of Caracalla, still magnificent in their ruins, were the inspiration of this architectural plan.

Although the building is low by contrast with its sky-scraping neighbors, its scope makes it impressive, and the lofty roof of the waiting room, raising high above the top of the surrounding structure, with its eight large semi-circular openings, 72 feet in diameter, adds dignity to the group of buildings and at the same time makes them a conspicuous landmark, when seen in perspective from the streets. In appearance it is a wide departure from the conventional railway station. One misses the turrets and towers and more than all the lofty arched train shed, but as the principal function of this station is performed underneath the streets, the upward and visible signs of the ordinary railway station are naturally absent. It will rather resemble some vast auditorium constructed on low lines for the easy ingress and egress of a multitude of people.

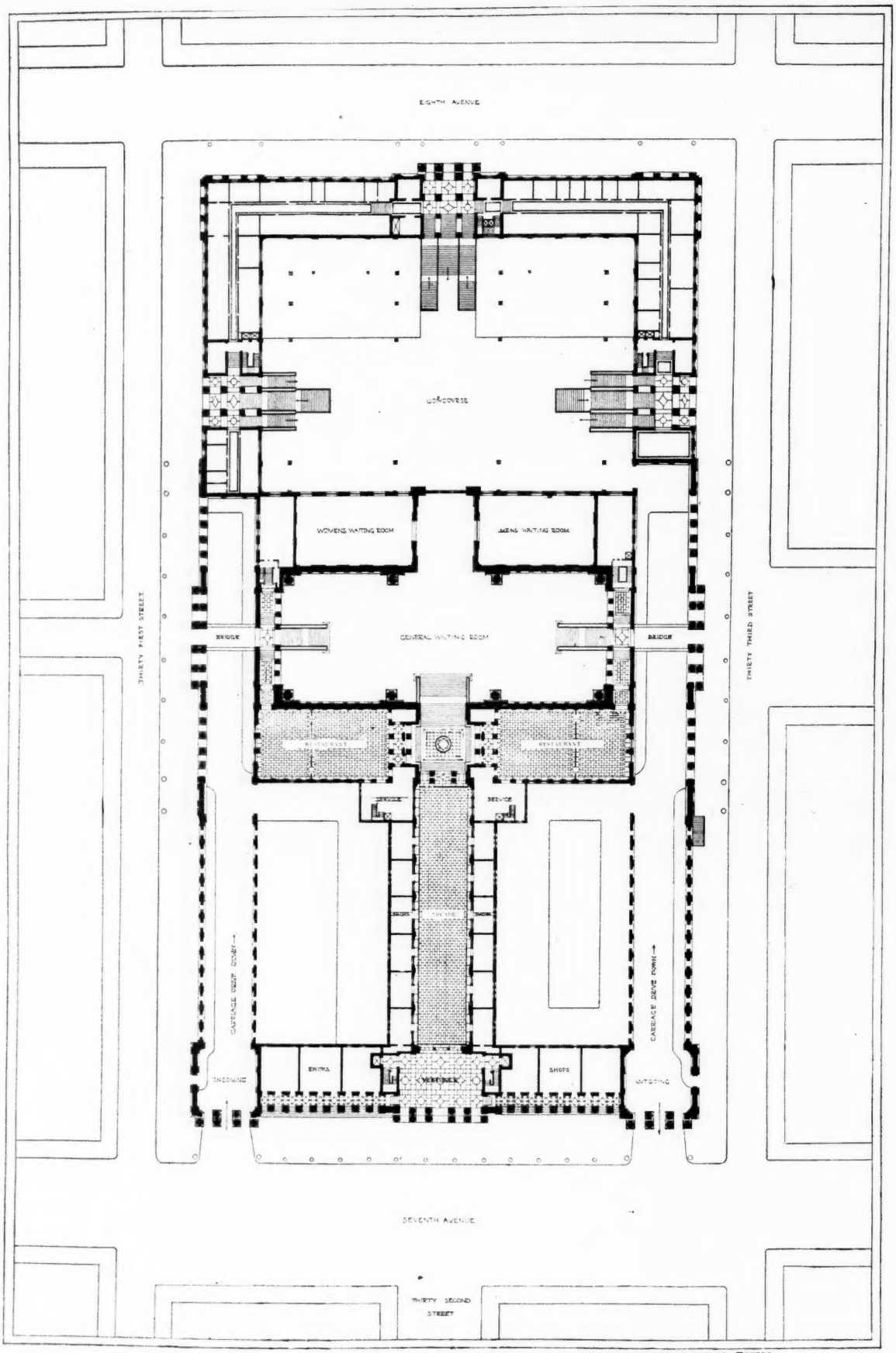
The exterior construction is to be of pink Milford Granite, similar to the building stone of the Boston Public Library, the University Club in New York, the Court House in Pittsburg and the Chamber of Commerce in Cincinnati. This is a particularly effective structural stone and its soft shades of color are uncommonly pleasing to the eye.

The main entrance is fixed in the centre of the structure on Seventh Avenue, opposite the intercepted end of Thirty-second Street. This is for foot passengers only,

PENNSYLVANIA RAILROAD STATION, NEW YORK CITY

and from the street entrance to the stairway to the main waiting room there extends an arcade 225 feet long and 45 feet wide flanked by shops, which will be occupied by merchants, whose wares will appeal especially to the requirements of travelers. On either side of the Seventh Avenue entrance there are also a series of stores. At the further end of the arcade the restaurant, lunch rooms and the cafe are established, with proper kitchens and service connections. Beyond is the general waiting room and the Concourse, all easy of access by convenient stairways.

At the corners of Thirty-first and Thirty-third Streets and Seventh Avenue are open pavilions, which furnish carriage entrances for incoming and outgoing traffic. Under cover carriages descend from the street level by a slight gradient about 20 feet to the level of the station proper, the Thirty-first Street incline being assigned as an entrance and the Thirty-third Street ascent as an exit.



PLAN AT STREET LEVEL PENNSYLVANIA RAILROAD STATION, NEW YORK CITY

By this arrangement carriage passengers are delivered at the most convenient entrance to the general waiting room.

Apart from the main entrance there are other convenient entrances for foot passengers from the street level to the general waiting room and Concourse from both the streets and the avenues. At a central point in both streets wide bridges leading into the street floor of the station span the carriage subway.

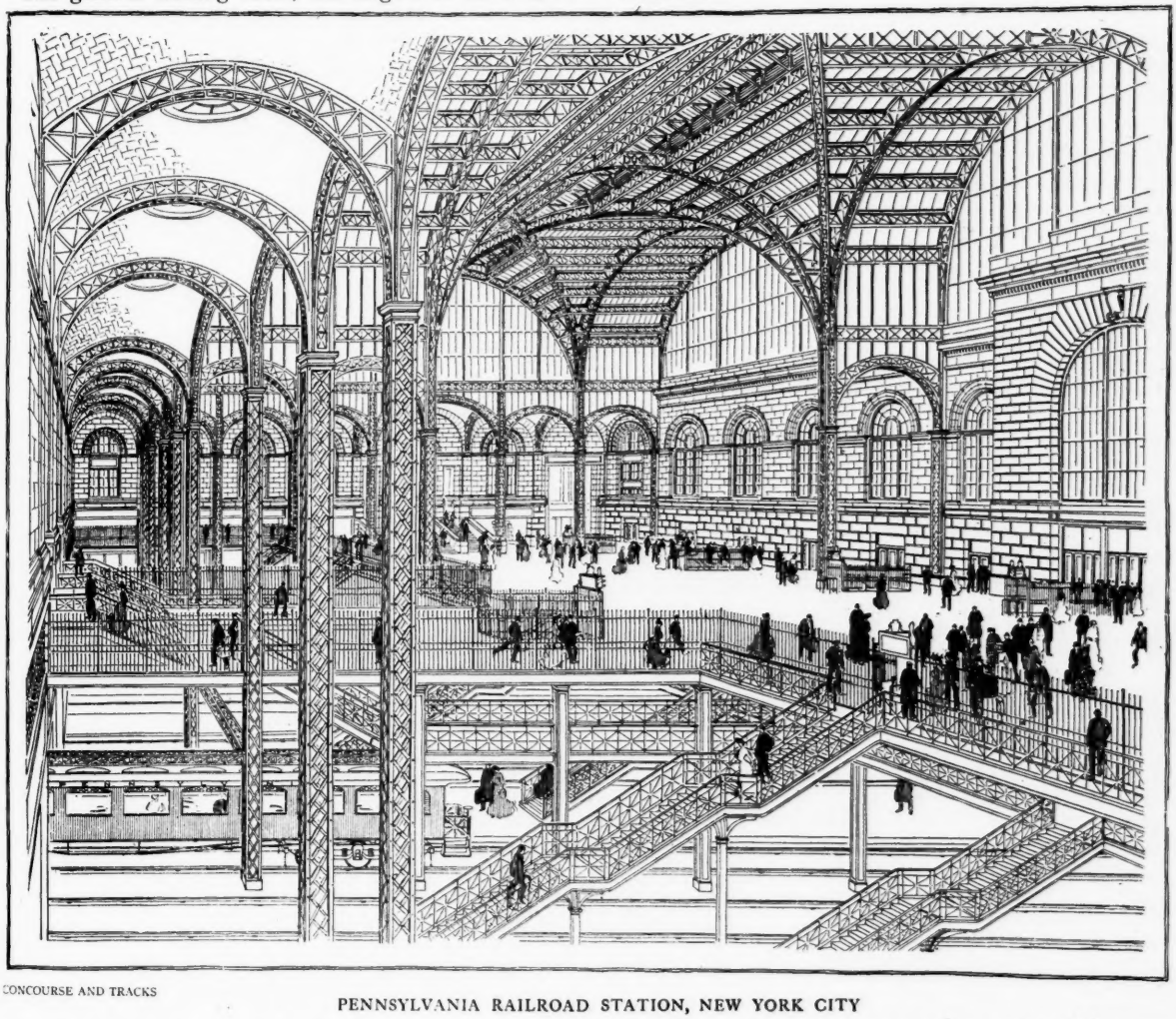
On the intermediate plane or level the real business of the passenger preparatory to his journey is transacted.

The general waiting room, the largest of its kind in the world, 320 feet long, 110 feet wide and 150 feet high, is the central section of the plan. Within its spacious walls will be located the ticket offices, parcel rooms, telegraph and telephone offices and baggage checking windows, all so disposed as to situation that a passenger may proceed from one to the other seriatim, with a minimum amount of exertion and without retracing his steps.

Adjoining the general waiting room on the west are two subsidiary waiting rooms, 58 by 100 feet, respectively for men and women, provided with seats, and opening into retiring rooms, with lavatories attached.

To the east of the general waiting room the main baggage room, with 450 feet of frontage, for the use of the transfer wagons, is located, covering the full area occupied by the arcade and restaurants on the plane above. The baggage is delivered and taken away through a special subway, 30 feet wide, extending under and along the entire length of Thirty-first Street and Seventh and Eighth Avenues. From the baggage room trunks are delivered to the tracks below by motor trucks and elevators.

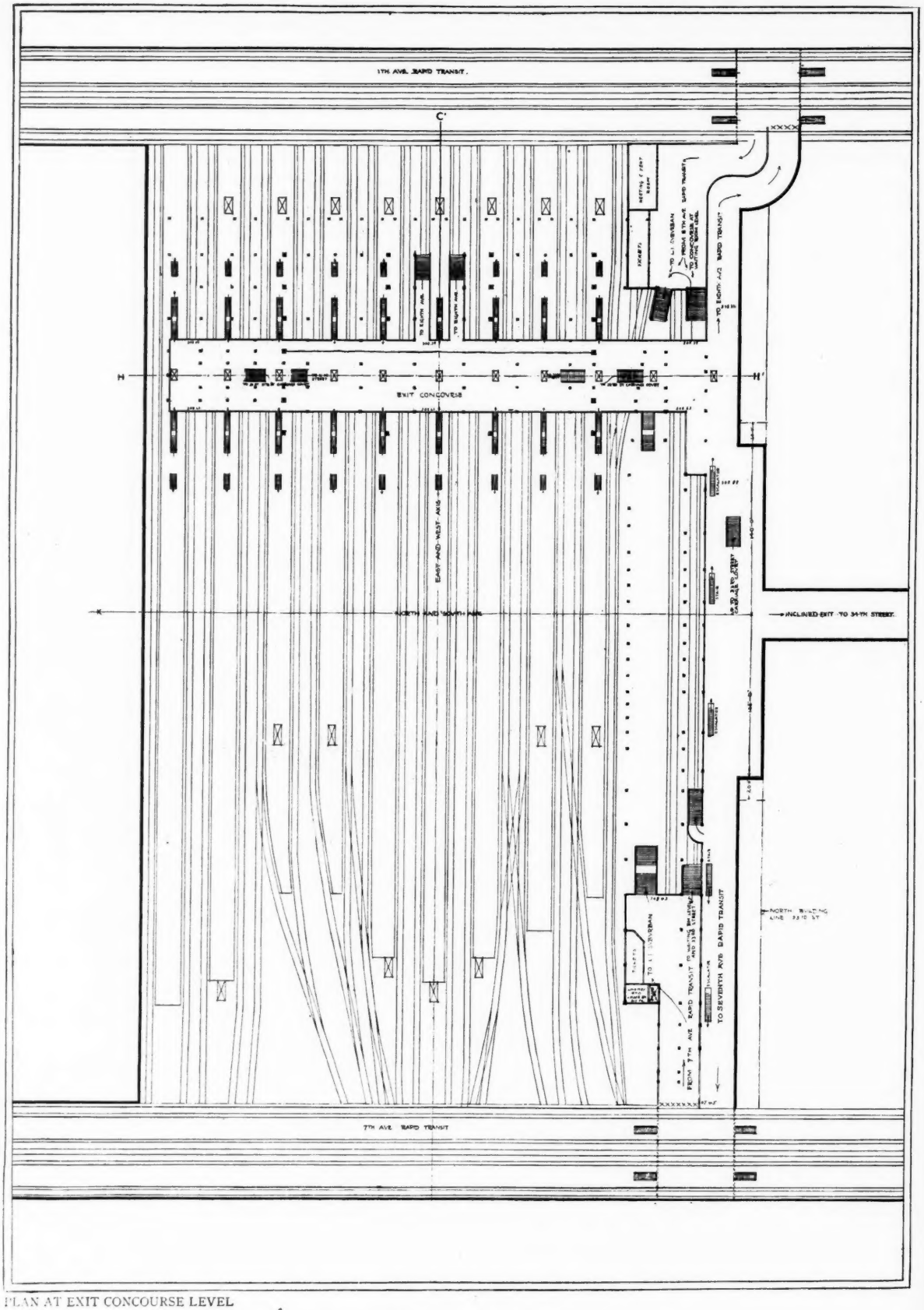
The cabstands will also occupy this level. There will be maintained an ample service of electric vehicles of varying capacities to meet the requirements of the hosts of travelers.



CONCOURSE AND TRACKS

PENNSYLVANIA RAILROAD STATION, NEW YORK CITY

Parallel to and connecting with the main waiting room by a wide thoroughfare and west of the subsidiary waiting rooms is the Concourse, a covered assemblying place over 100 feet wide, extending the entire width of the station and under the adjoining streets. An idea of the width of this Concourse is gained by a comparison of it with the lobby of the Jersey City train shed, which is narrower by twenty-five feet. This may be termed the vestibule to the tracks, as two sets of stairs descend from it to each of the train platforms on the track level. The Concourse and adjacent areas are open to the tracks, forming a courtyard 340 feet wide by 210 feet broad, roofed by a


7TH AVE. RAPID TRANSIT.
EXIT CONCOURSE
EAST AND WEST AVS.
NORTH AND SOUTH AVS.
INCLINED EXIT TO 34TH STREET
TO SEVENTH AVE RAPID TRANSIT
7TH AVE RAPID TRANSIT

PLAN AT EXIT CONCOURSE LEVEL

PENNSYLVANIA RAILROAD STATION, NEW YORK CITY

lofty train shed of iron and glass, similar in design to the famous train sheds of the new stations in Frankfort and Dresden, Germany. In addition to the entrances to the Concourse from the waiting room there are also direct approaches from Thirty-first, Thirty-third Streets and and Eighth Avenue.

The gates of the stairs descending from the Concourse to the trains will bear signs announcing the name, destination and the time of departure of the train on the particular platform where the stairs land.

The gates of the stairs descending from the Concourse to the trains will bear signs announcing the name, destination and the time of departure of the train on the particular platform where the stairs land.

Auxiliary to the main Concourse and located between it and the tracks is a sub-concourse, 60 feet wide, which will be used for exit purposes only. This passageway is 18 feet above the tracks, but is connected with the track level by two stairways and one elevator from each platform. From it ample staircases and inclines lead directly to Thirty-first, Thirty-third and Thirty-fourth Streets, to Eighth Avenue and to future rapid transit stations under Seventh or Eighth Avenues. Direct connection may also be made with the proposed subway stations on Herald Square without ascending to the street level.

The northern side of the station extending along Thirty-third Street will be assigned to the suburban service of the Long Island Railroad, into which trains will run from all points on Long Island by way of the East River tunnels. Ample entrances and exits are provided on Seventh and Eighth Avenues and Thirty-third Street, so that this traffic can be handled in connection with the adjacent subways and the surface lines on the surrounding streets independently of the rest of the station.

The third level which is at a depth below the surface of the street corresponding to the heighth of a four story building, is the track level. When the two tracks emerge from the tubes under the Hudson and reach the entrance to the station yards at Tenth Avenue they begin to multiply, and at Ninth Avenue, and extending into the station, the total number has grown to twenty-one. There is also a reduction in the number of tracks leading out of the station to the east, to a total of four for the main line, two passing under Thirty-second and two under Thirty-third Street, and thence under the East River to the Long Island City Yards. The track surface of the station may be compared to two unfolded fans joined together at the open ends, the handle of one extending under the Hudson and that of the other under East River. Within the station area, covering twenty-five acres of ground space, there are sixteen miles of tracks. This trackage area will afford ample facilities for easy movement of many hundred trains per day by the prompt and effiicent means of electric power. Through trains from the western side of the Hudson, after discharging passengers will proceed at once to Long Island City, where the train yards and terminals will be located, thus leaving the station tracks clear of any idle equpment, and likewise the westbound through trains made up at the Long Island City termitrances and exits independent of each other and separatnal will pass through the station, stopping only to take up their quota of passengers. The suburban service of the Long Island Railroad will be operated on the "shuttle" plan, by which the trains are kept in continuous motion in and out of the station.

The planning of the station, with its numerous ening the incoming from the outgoing throng, was worked out to faciliate, in greatest measure, the prompt and uninterrupted movement of traffic.

The expose of the building on all four of its sides to main arteries of street traffic gives the plan a flexibility, which is rarely obtainable in a building of such enormous proportions situated in the heart of a great city, and also insures the making of easy connections by underground subways with the future extensions of the city's Rapid Transit system under Seventh and Eighth Avenues and the cross streets.

The designs for the station were made by McKim, Meade & White, architects of New York, and will be executed under their direction.

Clay Slide at Boone Viaduct, Boone, Ia.

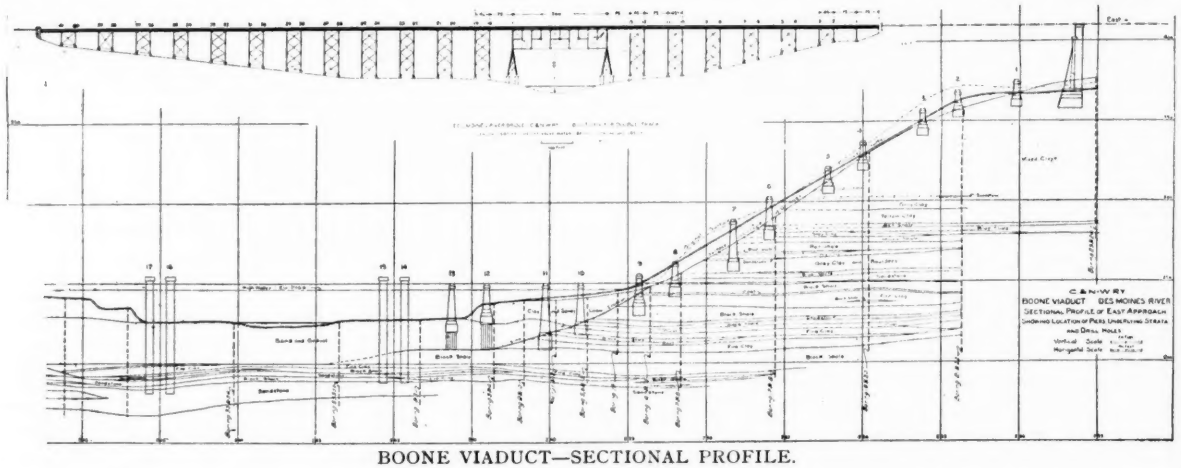
The location of this slide is about four miles west of Boone, on the C. & N. W. Ry., main line, in Boone County, Iowa. This section of the main line is a cut off across the Des Moines River valley between Boone and Ogden. It is a double track line known as the Boone County Railway and was built in 1899-1901 to eliminate curves and grades on old single track line via Moingona. On the old line the maximum grade is 1.5 per cent. and maximum curvature 6°. The maximum grades and curves on the new line are respectively 0.5 per cent. and 2°. The total reductions effected by this new line the,—Distance 3 miles, ascent—East bound, 158 ft., ascent West bound 158 ft., curvature 834°, and maximum grade from 1.5 per cent. to 0.5 per cent.

The bridge across the Des Moines River on the new line is a double track steel viaduct consisting of a channel span of 300 ft., and approaches of alternate 75 ft., and 40 ft., deck plate girders supported on towers. The East approach is made up of eight 75-ft. spans and six 45-ft. spans, the first two spans being each 75-ft. long, supported by a rocker bent instead of a tower. The West approach consists of thirteen 75-ft. spans and twelve 45-ft. spans all resting on towers. The channel span is supported by "A" shaped steel bents resting on steel cylinders filled with concrete and capped with Ableman's sand-stone.

Each tower leg in the approaches rests on a stone pier. The foundation of all piers in East approach except Nos. 2, 3, 4, 5, 11, and 12, was carried down to a stratum of black shale. Piers Nos. 2, 3, 4, 5, are founded on hard

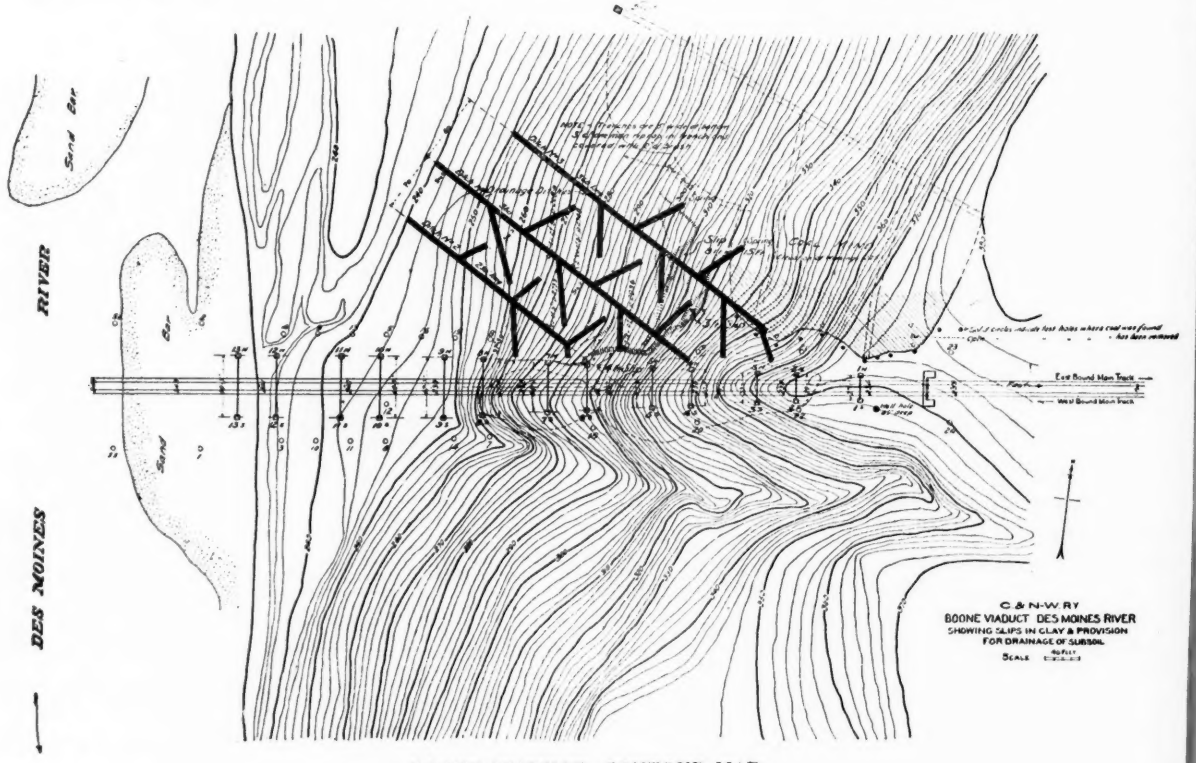
clay, and piers Nos. 11 and 12 have pile foundations. The cylinder piers supporting the channel spans are carried down to a thick bed of sand-stone about 40-ft. below low water.

The surface formation of Boone County, is of glacial origin and belongs to the period called the Wisconsin drift. The Des Moines River valley is supposed to be a later formation. The river has cut through the drift and deep into the coal measures throughout its course in the county, leaving a valley bordered by precipitous bluffs deeply laid with glacial debris. The depth of the valley is approximately 180 to 200 feet. The glacial drift is between 60 and 80 feet deep at the upper edge of the valley and the debris on the sides of the slopes, is approximately 10 to 30 feet deep. Underlying the drift are alternate strata of clay, shale, coal, fire clay and sand stone. These strata lie in level planes and are rather thin, ranging from 2 ft. to about 20 ft. in thickness, and somewhat indiscriminately mixed, the coal being the thinnest and the fire clay and sand stone the thickest layers. The accompanying profile shows the strata and the line of erosion as determined by borings along the line of the bridge.


C & N-W RY
BOONE VIADUCT DES MOINES RIVER
SECTIONAL PROFILE OF EAST APPROACH
SHOWING LOCATION OF PIERS UNDERLYING STRATA
AND DRILL HOLES

BOONE VIADUCT—SECTIONAL PROFILE.

The slip, or slide, occurred in the mixed clay of the glacial drift in the vicinity of piers Nos. 4 to 6 on the east bank of the river valley and on the North side of the viaduct. This is at an elevation of from 65 to 105 ft. above low water in the river. The first indication of any tendency of this surface material to slide was observed in



BOONE VIADUCT—CONTOUR MAP.

the latter part of June, 1905, following a severe and unusually heavy rainfall during the last week of that month. An inspection of the situation showed a ditch-like depression about 12 ft. wide and 3 to 4 ft. deep running in a northeasterly direction and starting at a point about 50 ft. from pier No. 5. From the southwest end of the depression a crack extended towards the bridge coming up to pier No. 6 and running partly around that and then on, down the slope, towards pier No. 7. The bottom and sides of this depression were regular enough to, at first, suggest a belief that the settlement was caused by the caving in of an old heading in an abandoned coal mine north of the bridge. Subsequent developments proved this to be unlikely. It very soon became evident that the crack near pier No. 6 was deepening and lengthening as other cracks and fissures were appearing. The Chief Engineer was notified and he, in company with the Asst. Chief Engineer, made a trip to Boone and looked over the situation very carefully on June 30th. A plan for draining the side hill was immediately made at Mr. Carter's direction and work was commenced the following day. By this time further slips had taken place and the situation was about as shown on accompanying plan. In places where the vertical slip amounted to two feet or more the material rolled up below in a mud wave. It was impossible to walk in some parts of the side hill on account of the soft ground and these mud waves. The excessive amount of moisture in the ground caused the surfaces of two adjoining clay strata to slip upon each other making depressions, slips and waves in the overlaying earth.

The plan decided upon by Mr. Carter was to construct two large deep drains running down hill from the bridge at an angle of about 37° 30′ with the track. A sufficient number of branches were to be provided to thoroughly drain the area involved in the slide. The plan was carried out in every particular as proposed except an additional ditch No. 3 was built north of the first two. Before the excavation for the main ditches could proceed it was found necessary to construct a temporary drainage ditch to dispose of the surface water. The main ditches are five feet wide on the bottom and vary in depth from about four feet at the lower end to nine or ten at upper end. Ditches Nos. 1 and 3 are each 360 ft. long with six branch ditches each. No. 2 is 230 ft. long and has five branches. The branches or laterals are the same size as the main ditches. The bottoms of all ditches are filled to the depth of three feet with "one-man" rip-rap and on top of this is placed a layer of willow brush two ft. thick. The ditches are back-filled with material from the excavation. The ditches were opened up to whatever depth was necessary to get about one or two feet below the line of slip. A report of progress of the work dated July 30th stated that ditches Nos. 1 and 3 had been opened up for a distance of 250 ft. and 150 ft. respectively. It also says: "Since commencing work on these ditches the ground has slipped a distance of about two feet all the way down the slope. The point where slipping takes place is about 8 feet below the surface." This line of slip was very well defined. It occurred along a very thin stratum of dark red clay about one-sixteenth inch between two layers of blue clay. As a matter of precaution a strut was placed between piers 5 and 6 on the north side. This was built up out of four (4) 8-in. by 16-in. fir timbers in pairs with diagonal braces between. No derangement or settlement of any piers occurred, however.

The work was completed September 1st, 1905. The working force varied from 20 to 70 men, great difficulty being experienced in getting and keeping a full force of men. As an illustration, 70 men were sent from Chicago during five days between July 19 and 26th. Seven of these men were working July 26th.

Thirty-nine cars of rip-rap were used besides a large amount of sheet piling and miscellaneous material. The cost was as follows:

Material	$1,425.00
Labor	5,725.00
Total	$7,150.00

The success of this drainage plan seems to be assured as the ground has dried out and slipping has been stopped.

IN a paper by Mr. Robert A. Cummings on "Reinforced Concrete," delivered to the Railway Club of Pittsburg, the following excellent suggestion was brought out. An extract will probably give the clearest view of the matter:

"There is another application that I think will appeal to railroad people and that is its (reinforced concrete) application to sand and coal bins. It is particularly advantageous in use there. The sulphur from the coal will destroy coal bins in a very short time. A friend of mine a short time ago built a wooden coal bin and it burned up. Then he built a structural steel bin. I think it lasted a year. Then he came to me to build him a concrete bin. That, he thought would last indefinitely."

The usual and probable only objection to such a use of reinforced concrete lies in the initial cost. As to the practicableness of the scheme there is little doubt for the excellent results that have been gained by properly made up concrete, leave scarcely any faults to be found. Such troubles as fire, sulphur from the coal, and even the wear of the coal itself would have little effect on the concrete style of bins.

Modern Railway Coal Chutes.

*NO. II

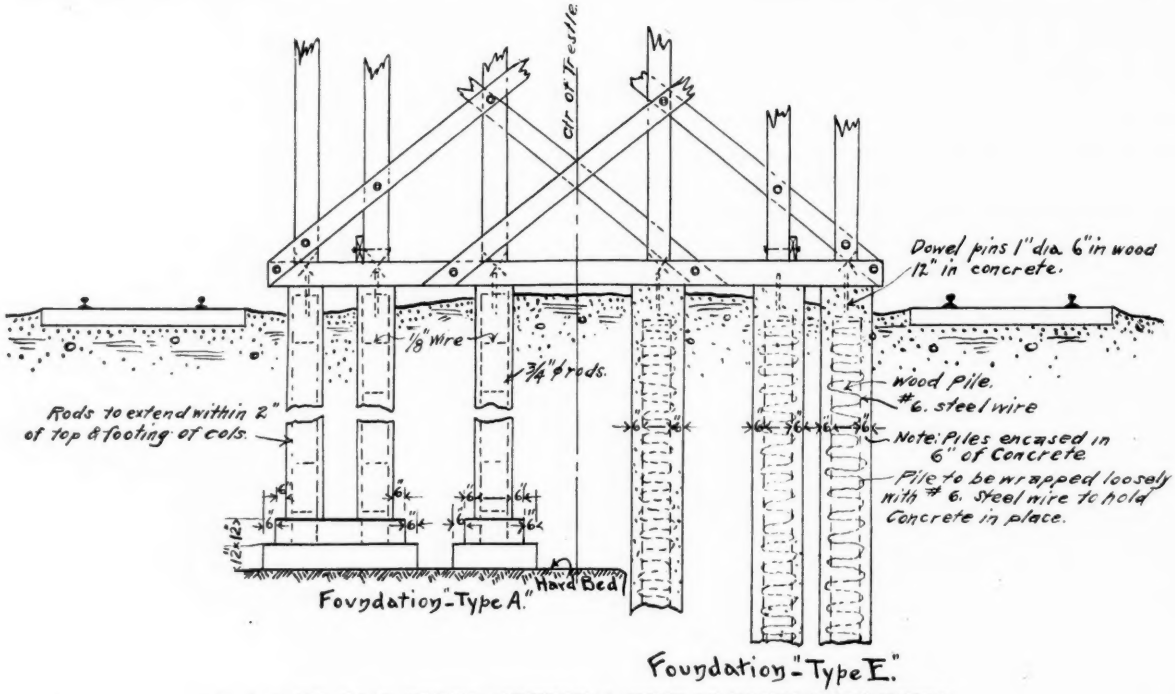
THE standard type of coal chutes which the Baltimore & Ohio railroad is at present installing, is what may be called the "Long trestle approach." This type is conceded to be the "ideal," as has been mentioned before, where the space is available for such an approach. In pushing cars to the top, the work is done by the switch engine used for this purpose, dispensing with any auxilary engine and cable work. A coal chute of this type and of which illustrations are here given has been put in service on the Philadelphia Division of the B. & O. at East Side. Phildelphia.

At the foot of the approach the track leading to the chute is curved slightly allowing another track to swing out with a 38 foot lead and a No. 6 frog, the two diverging till a 12 ft. center to center is reached which is kept on up the trestle and over the coal pockets. This structure is also different from most in that a sand house has been placed directly adjoining the chute itself.

The approach itself is with a 5% grade and is some 650 ft. long gaining a rise of 34 ft. from base to base of rails. For the supporting structure itself, two stringers each 8 in.×16 in. are laid under the ties in an approximately direct position under each rail in the customary manner. Guard rails are 6-in.×8-in. and notched 1 in. over ties. As this is a double track structure the caps are slightly larger than generally used, being 12-in.×14-in. stuff while the timber in the bents is the usual 12-in.×12 in. with 3-in.×10-in. bracing. Drift bolts as used for connecting the stringer to the caps, sills to piling, etc., are ¾-in.×24-in.

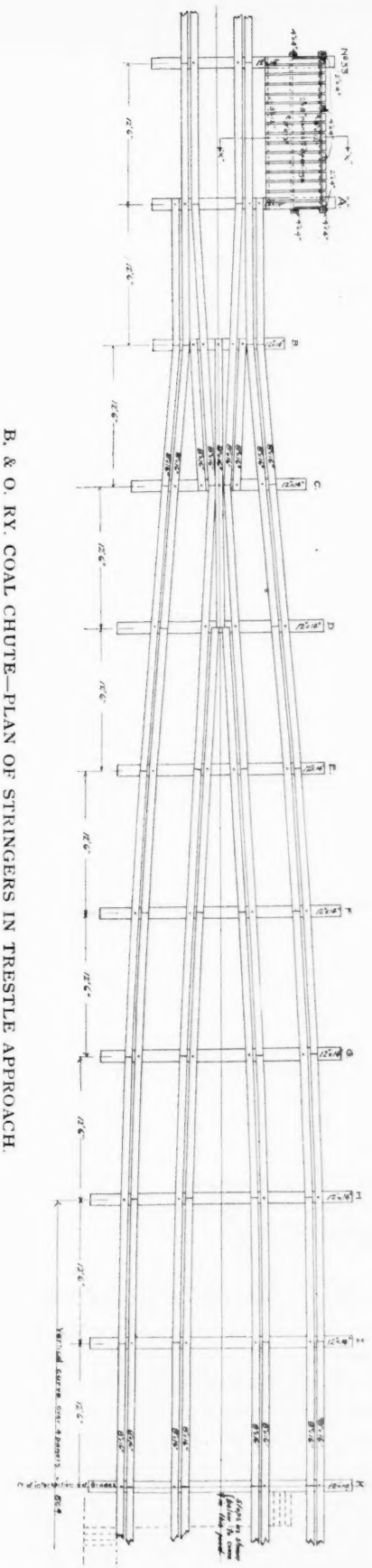
An interesting feature of this structure is the several different kinds of foundation piers and piling that has been used, owing to the varying nature of the ground and the different portions of the work. Type "A" as shown in the illustration showing the "Elevation of Bent 'A'" is wooden piling wrapped round with ⅛-in. wire in order to secure a good purchase for the concrete which surrounds the piling to a thickness for all of 18 inches. The concrete itself is further reinforced by ¾-in. cast iron rods, the whole resting on two concrete footings of 1 ft. in depth for each, with a 6-in. projection for the courses. These two courses rest directly as called for on "Hard Bed" Type "B" as shown is the ordinary piling. **Type "E" has the wooden piling wrapped with No. 6** steel wire to hold the concrete, which incases the piling, in place. The concrete surrounds to a thickness of 6 in. and is continued from the base of the sill down for 13½ ft. while the piling itself is somewhat longer. The bents for the approach which are 44 in number, rest on the Type "A" foundation, while Type "E" is to be found under the coal pockets or chute proper.

When loaded to their capacity the coal pockets can take care of some 450 tons of coal. In this connection it might be of interest to mention the capacity of the sand bins,

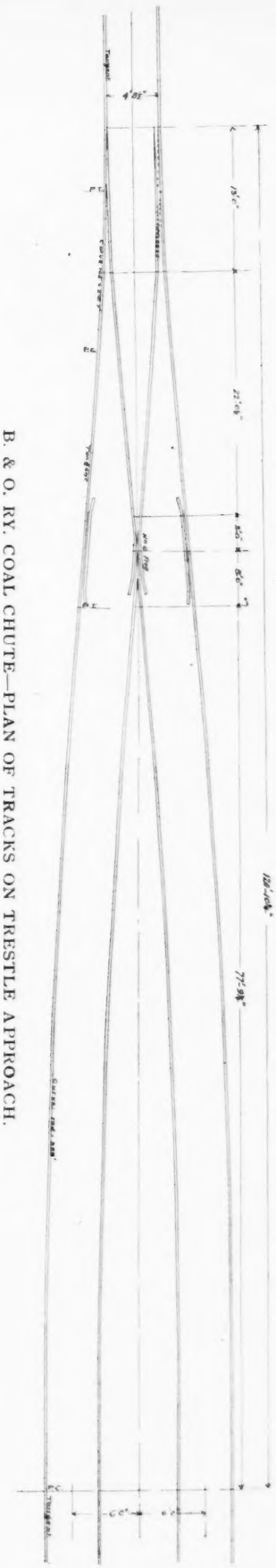

Ctr of Trestle
Dowel pins 1" dia. 6" in wood 12" in concrete.
⅛" wire
¾" ϕ rods.
Wood Pile.
#6. steel wire
Rods to extend within 2" of top & footing of cols.
Note: Piles encased in 6" of Concrete
Pile to be wrapped loosely with # 6. steel wire to hold Concrete in place.
Hard Bed
Foundation "Type A."
Foundation "Type E."

B. & O. RY. COAL CHUTE—SECTIONAL VIEW OF FOUNDATION TYPES.

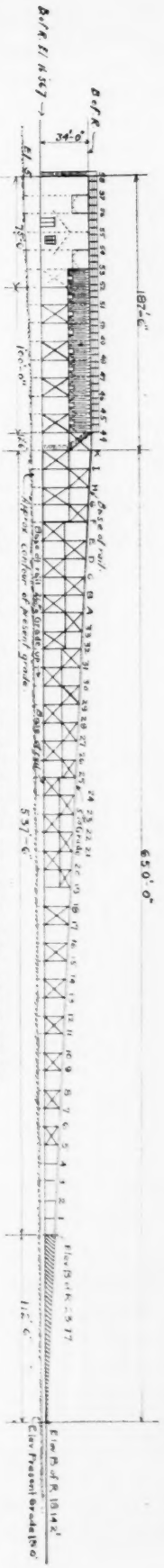
*The second of a series of articles on "Modern Railway Coal Chutes begun in the June issue.



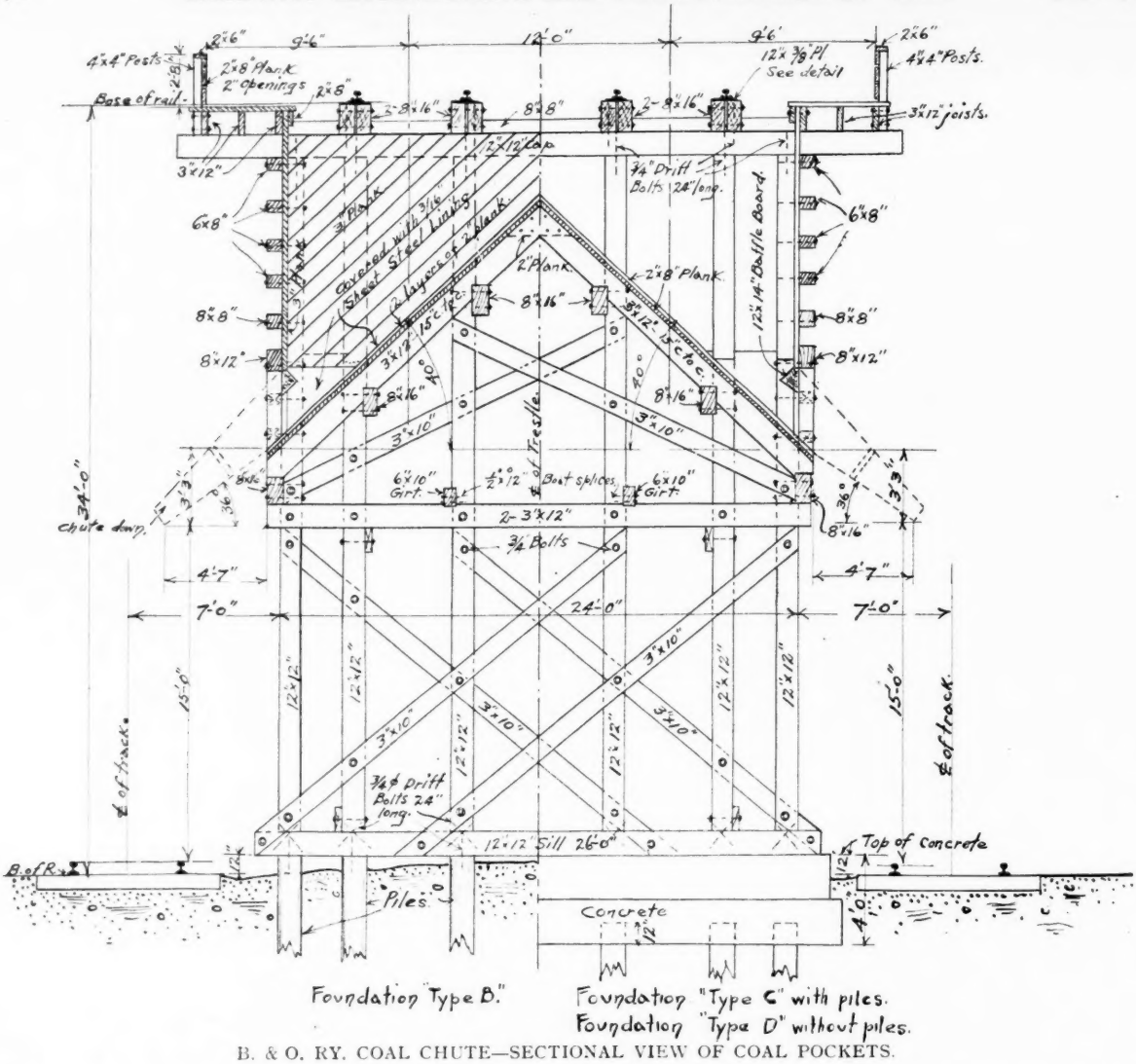
B. & O. RY. COAL CHUTE—PLAN OF STRINGERS IN TRESTLE APPROACH.



B. & O. RY. COAL CHUTE—PLAN OF TRACKS ON TRESTLE APPROACH.



B. & O. RY. COAL CHUTE—ELEVATION OF TRESTLE APPROACH.



B. & O. RY. COAL CHUTE—SECTIONAL VIEW OF COAL POCKETS.

which is 1,800 cu. ft. or 90 tons for the dry sand bins and 40,000 cu. ft. or 1,800 tons for the wet sand bins.

The coal tipple is a double one permitting of the loading of coal on either side. In the inner arrangement the floor is of the usual roof type with the peak coming in the center below the two tracks. For the flooring 3-in.× 12-in. timber has been used, spaced 15 in. center to center and covered with two layers of 2-in. planking and the whole covered with 3-16-in. sheet steel lining.

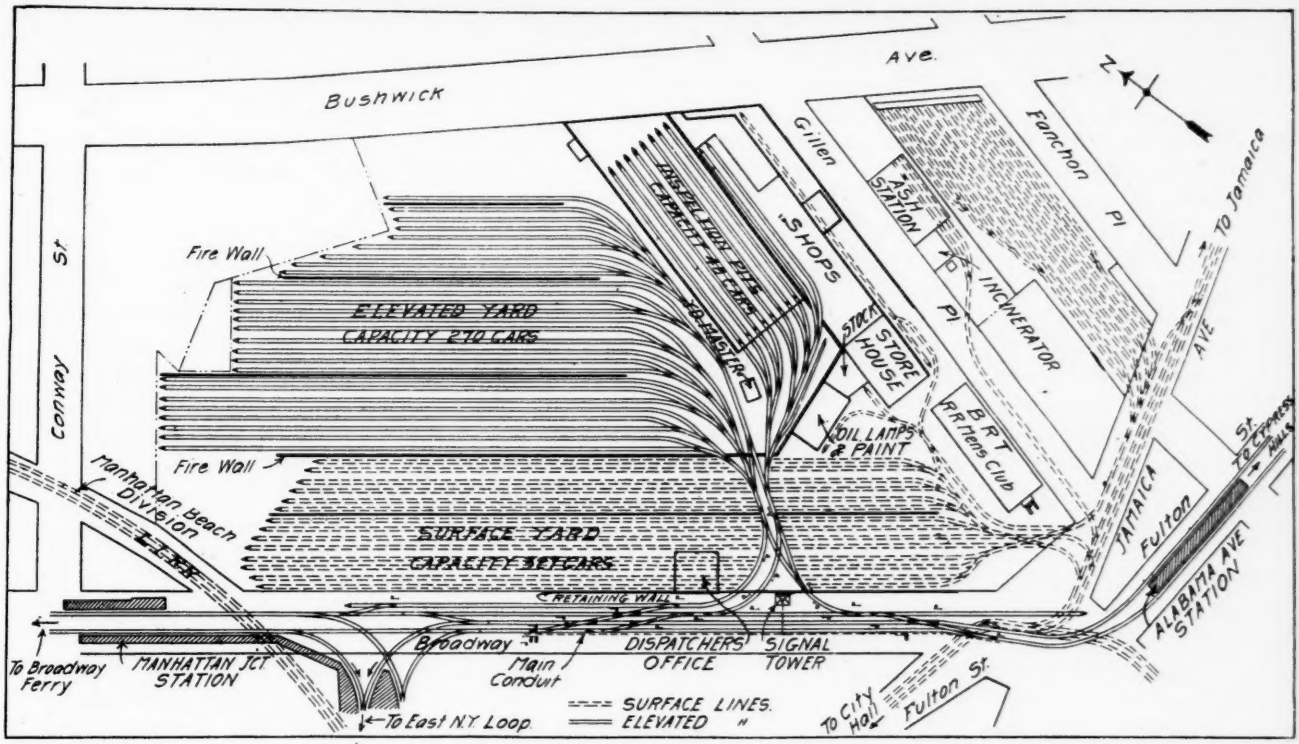
When dropped for loading the bottom of the coal apron is 15 ft. above the top of rail and swings out from the tipple with a clearance of 4 ft. 7 in. The clearance from the center line of the track to the coal chute posts is an even 7 ft.

Probably the most noticeable feature of the entire work is the large amount of concrete used in the foundation both for foundation courses and for the protection of the piling. This will no doubt have its reward in the increased life, for there is very little loss if any, ever noticed when a little extra work is expended on the foundation of a structure.

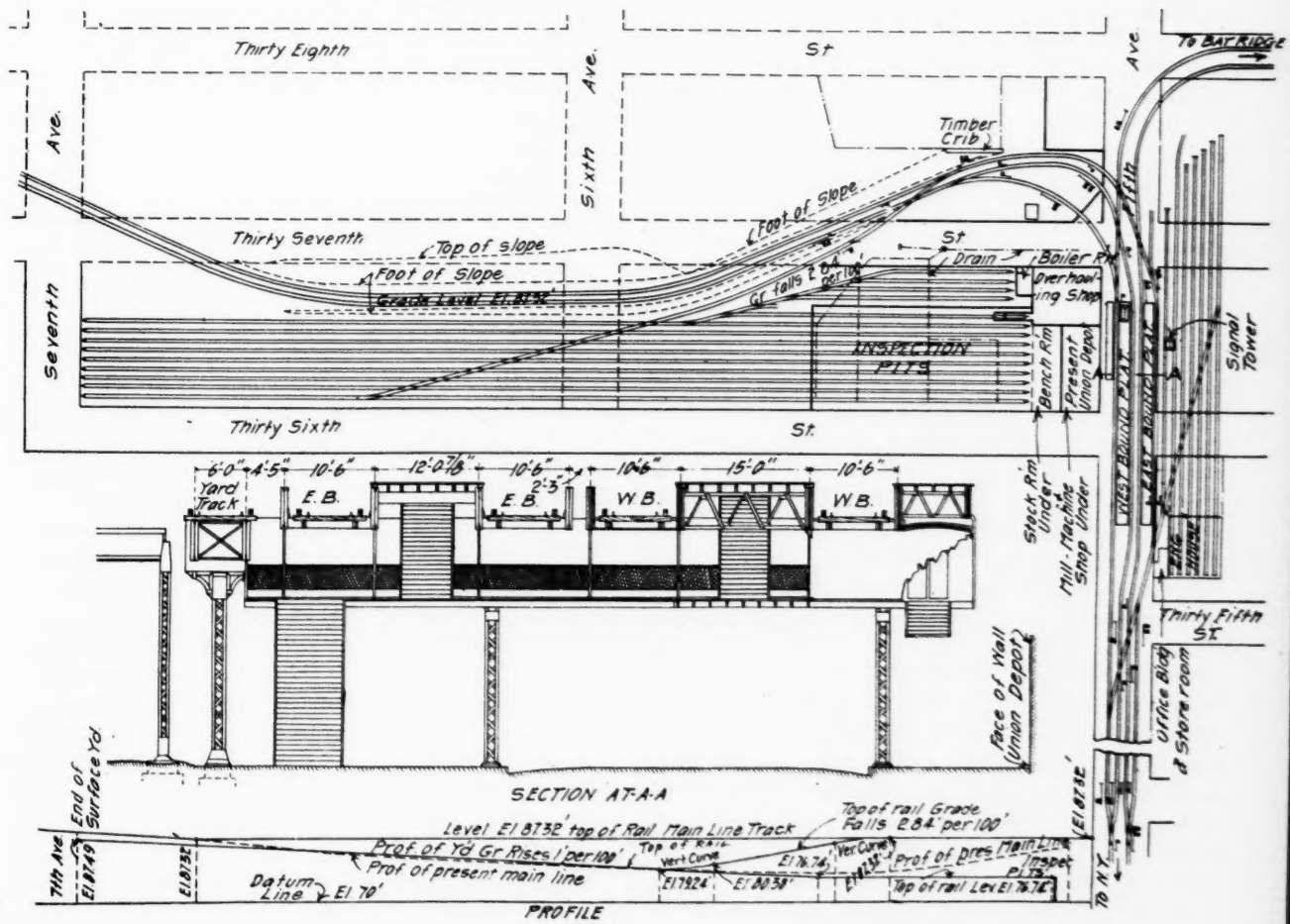
Brooklyn Rapid Transit Co's Elevated and Surface Lines.

THE mileage of this company comprises some 463.8 miles of surface lines, 68.4 miles of elevated lines and also considerable subway track. Since July 1, 1902, the company has expended on these lines approximately $22,000,000 in order to put them in a thoroughly safe and up to date condition. In 1905, $8,000,000 was spent on existing lines, out of which $625,000 was expended on track, $1,800,000 for power station equipment, $900,000 for bridges and terminals and $1,000,000 for miscellaneous improvements. During the present year $7,000,000 is to be expended of which $2,800,000 will be devoted to tracks and buildings, $1,650,000 to the power station, and $450,000 to sub-stations. The work so far done has involved a large number of very interesting engineering features.

Among the locations offering interesting forms of construction is the junction of the elevated and surface lines



EAST NEW YORK STORAGE YARDS OF THE BROOKLYN RAPID TRANSIT CO



THIRTY-SEVENTH ST. YARDS OF THE BROOKLYN RAPID TRANSIT CO.

at East New York, a layout of which is shown in the accompanying illustration. There were located originally at this point some engine and car houses of wooden construction. At present these have been torn down and are being rapidly replaced by a two-story shop, inspection sheds and other buildings and also by an elevated storage yard with a 270 car capacity and a 327 surface car capacity yard. Due to the peculiar situation of the yard it was necessary to construct a rather complicated structure so as to give an entrance to the elevated yards from the main tracks. The traffic is very heavy at this point, and, as it was necessary to use the connections constantly during the construction, the proper design and erection encountered considerable difficulty.

The installation of the electro-pneumatic interlocking plant is a part of the new works, and is similar to those in service on the Boston Elevated, and Boston Terminal railways, but in addition patents were used of the Brooklyn Heights Railroad Co. Convenient structures for the offices of the signal engineer, trainmaster and dispatcher has been built a short distance from the new signal tower and on the elevated level. This building also contains rooms with lockers and other appurtenances for the use of trainmen.

Throughout the works, the prevention of fire dangers appears to have been ever present in the minds of the designing engineers. A concrete and hollow tile fire wall, which is indicated in the layout, separates the elevated and surface yards, both of which are divided into sections by four other fire walls, each reaching to a height of 15 ft. above the rails. The construction of the foundation, consists of concrete piers spaced 20 ft. center to center, resting on firm earth foundations at an average depth of 18 or 19 ft. Concrete girders reinforced with two lengths of steel rail are placed on these piers. All of the retaining walls, fire walls and concrete foundations throughout have been directly constructed by the railroad company itself.

Some interesting problems developed in the constructing of the shops and inspecting pits. The pits have been built according to standard practice and have a capacity for 48 cars and are entirely of reinforced concrete. The fact that the ground upon which the building stands is composed of loose ashes to a depth of 20 ft. and over made it necessary to carry concrete piers down to the original earth, in some instances to a depth of 28 ft. The side walls, which are of solid concrete, are carried on reinforced concrete girders resting on these piers, rails having been used for reinforcement. The inspection pit is floored with concrete, having rails imbedded at regular intervals, the whole resting upon floating foundations in the loose cinder filling. There are eight tracks placed 13 ft. 3in. apart. In one corner of the inspection shed has been built an armature winding room and bake oven, while in the space adjoining, a water meter has been installed with four connections with the city water main, insuring the delivery of a plentiful supply of water to the system of hydrants in various parts of the yard.

On the upper floor of the shops, which adjoins the inspection sheds are two tracks, being separated from the former by a fire wall. This upper floor is devoted entirely to the repair of cars, while the lower floor is devoted to the various departments of repair shop work. The equipment of the shop includes three large hydraulic lifts, which make the operation of jacking up one end of a car, lowering the trucks to the shop floor level and lifting a new pair into place, an operation of four minutes duration. The shop is equipped with cranes and labor saving tools of recent design. The blacksmith shop has a total of 14 forges. In the northern end of the building is located the storehouse and in separate buildings are the lamp room and oil storage house. The feature in the construction of the shop building, however, is the two-inch wire lath and plaster wall together with the fireproof brick walls dividing the building into sections.

Another interesting feature at this location is the provision which has been made for heating all of the buildings.

Opposite the shop, and on the east side of Gillen Place, is an ash-collecting station which is one of many distributed throughout Brooklyn. The street cleaning department delivers certain forms of the city waste to this station, which is assorted by pickers. That portion of the refuse which is of no value goes to the incinerator, the heat from which is utilized, through a system of indirect radiation, for heating the surface repair shop, the club house, the shop foreman's office, the two story shop, the inspection shed, including the armature room, and the dispatcher's office. Cars belonging to the street railway are used to carry away the portion which cannot be burned, together with the ashes from the incinerator. One of the several club houses of the employes of the Brooklyn Rapid Transit Co. is also located near this point of the system. It is managed by the men themselves and contains every appurtenance of the modern, well equipped club house.

At Fifth Ave. and Thirty-sixth St., where the line from Coney Island joins the main Fifth Avenue route, some interesting improvements are under way. The company's business has now become so heavy at this point that the property has required almost entire reconstruction. The Coney Island tracks at one time ran into the station at right angles to the line of the elevated road and the passengers were forced to transfer. Now, however, a junction has been effected at a rather heavy, although not a difficult gradient. A large storage yard has also been built here with a series of inspection pits, having space for 54 cars over the pits, and an entire reconstruction of the station is under way. At this point, the difficulties arising from the false filling in the East New York improvements, were not met with and the floor construction is of concrete resting on firm earth foundation. Another yard is laid out across Fifth Avenue at right angles to the one mentioned and the main tracks are protected at the crossings with the yard tracks by a modern plant of interlocking semaphores and switches.

Improvements are also under way at the site of the Ninth Avenue depot where two new buildings are in

process of construction. With the insurance risks still prominently in mind, one building is being constructed in a series of double-tracked bays, separated from each other by fire walls of reinforced concrete, which rise above the roof in the form of parapets to prevent the passage of flames. There are eight of these bays, each with a track capacity for 14 cars. Fire risk is further lessened by the presence of two hydrants in each bay. Work at this point involved the erection of an exceptionally heavy concrete retaining wall along Nineteenth and Twentieth streets, owing to the height of the street above the track level. At the street level, this wall supports the roof girders of the second building, the steel structure of which rests elsewhere on concrete piers upon a solid earth foundation.

Railway Engineering Personals.

Mr. S. W. De Wolf has been appointed resident engineer of the National of Mexico at Monterey, Mex.

Mr. B. Gilleas, heretofore roadmaster of the Illinois Central at New Orleans, La., has been appointed roadmaster of the Missouri Pacific at Saint Louis, Mo.

The headquarters of Mr. G. K. McCormick, roadmaster of the Atlanta division of the Louisville & Nashville, have been removed from Knoxville, Tenn., to Mariette, Ga.

Mr. Azel Ames, Jr., signal engineer of the Lake Shore & Michigan Southern, has been appointed signal engineer of the electric zone of the New York Central & Hudson River, with headquarters at New York, succeeding Mr. W. H. Elliott, assigned to other duties.

Mr. A. J. Irwin has resigned as chief clerk to the chief engineer of the Gulf Colorado & Santa Fe at Galveston, Tex., to become manager of the San Luis-Mateo Company at Zacatecas, Mex. Mr. J. J. Cummings will succeed Mr. Irwin as chief clerk.

Mr. T. E Hill, roadmaster of the Illinois Central at Fulton, Ky., has been transferred to New Orleans, La., in a similar capacity, succeeding Mr. B. Gilleas, resigned. Mr. J. M. Egan, roadmaster at Nashville, Tenn., has been appointed to succeed Mr Hill at Fulton, Ky., and Mr. F. M. Oren has been appointed roadmaster at Nashville in place of Mr. Egan.

T. H. Morgan, general foreman of bridges and buildings of the Gulf Colorado & Santa Fe, died recently at Cleburne, Tex.

Mr. H. F. Meeker has been appointed engineer of maintenance of way of the Alton Granite & St. Louis, with headquarters at Alton, Ill.

Mr. J. A. Hinman has been appointed principal assistant chief engineer of the Cananea Yaqui River & Pacific, with office at Culiacan, Mex.

Mr. Julius S. Jensen, of New Haven, Conn., has been appointed superintendent of power stations of the Consolidated Railway Company, including all the lines in Connecticut, Massachusetts and Rhode Island.

Mr. V. E. McBee, Jr., has been appointed assistant engineer of the Seaboard Air Line at Birmingham, Ala., to succeed Mr. C. R. French, resigned.

Mr. John A. Hanlon, of Coshocton, O., has been appointed engineer of construction for the improvements of the Ohio canal, between Akron and Dresden, O.

Mr. George H. Sawyer has resigned as resident engineer of the Lake Shore & Michigan Southern at Dunkirk, N. Y., to become chief engineer of a railroad in Chile.

Mr. G. B. Nicholson, chief engineer of the Cincinnati New Orleans & Texas Pacific, has been granted a leave of absence until January 1 next, owing to ill health.

Mr. W. F. Purdy has been appointed assistant engineer of the Wabash at Pittsburg, Pa., succeeding Mr. C. S. Lambie, resigned to engage in contracting business.

Mr. L. D. Blauvelt has been appointed assistant chief engineer of the Colorado-Utah Construction Company, with headquarters at Denver, Colo. This company is building the Denver Northwestern & Pacific Railway.

Mr. Charles Paquette, superintendent of the Chicago division of the Cleveland, Cincinnati, Chicago & St. Louis, has been appointed assistant chief engineer, with office at Cincinnati, O.

Mr. Ernest E. Hanna, general foreman of the Pittsburg & Lake Erie at Pittsburg, Pa., has been appointed traveling accountant under Mr. M. L. Byers, chief engineer of maintenance of way of the Missouri Pacific at Saint Louis, Mo.

Mr. John P. Brooks, formerly for seven years on the instruction staff of Lehigh University, and since 1897 professor of civil engineering in the State College of Kentucky, has been chosen assistant professor of civil engineering in the University of Illinois.

Mr. F. R. Layng, heretofore engineer of bridges of the Bessemer & Lage Erie, has been appointed engineer of track, succeeding Mr. E. J. Randall, principal assistant engineer, the latter title having been abolished. Mr. H. H. Harman has been appointed acting engineer of bridges. Headquarters, Greenville, Pa.

Mr. H. A. Hoke has been appointed assistant engineer in the office of the mechanical engineer of the Pennsylvania, at Altoona, Pa., effective on June 1.

Mr. E. W. Lewis has resigned as division engineer of the Portland & Seattle, with headquarters at White Salmon, Wash., to accept a position with another company.

Mr. J. F. Deimling has resigned as chief engineer of the Pere Marquette, and has been succeeded by Mr. E. K. Woodward, with headquarters at Detroit, Mich. Effective on June 1.

Mr. W. A. Gordon has been appointed acting general foremen of bridges and buildings of the Gulf Colorado & Santa Fe, with office at Cleburne, Tex., succeeding Mr. T. H. Morgan, deceased.

Mr. R. C. Hengst, assistant chief engineer of the Western Allegheny, with office at New Castle, Pa., has resigned to enter the contracting business with Mr. F. A. Maselli, of Rochester, N. Y.

Mr J. W. Stewart, chief engineer of the Raleigh & Pamlico Sound, with headquarters at Raleigh, N C., has had his jurisdiction extended over the Virginia & Carolina coast, succeeding Mr. A. N. Bullitt, resigned.

Mr. L. F. Whitbeck, assistant division engineer of the Mexican Central, has been appointed resident engineer at Guadalajara, Mex.

Mr. L. F. Whitbeck, assistant division engineer of the Chicago, Rock Island & Pacific at Chicago, in place of Mr. M. J. Brew, promoted.

Mr. W. J. Backes has been appointed chief engineer of the Central of New England, with headquarters at Hartford, Conn., succeeding Mr. W. B. Chapin, resigned.

Mr. Joseph McCabe has resigned as vice-president and general manager of the Washington & Columbia river to become associated with Charles S. Bihler, of Tacoma, Wash., in general railroad construction work.

Mr. Paul Bernard has been appointed roadmaster of the Peru-North Judson division of the Chicago, Cincinnati & Louisville, and Mr. R. M. McGill has been appointed roadmaster of the Peru-Cincinnati division.

Mr. N. J. Tubbs, who recently resigned as chief engineer of the Boyne City, Gaylord & Alpena, to accept a position with Riggs & Sherman, civil engineers of Toledo, O., has been appointed resident engineer of the Grand Trunk Pacific.

Mr. W. F. H. Finke has been appointed tie and timber agent of the Southern, with office at 1300 Pennsylvania avenue, Washington, D. C.

Mr. H. S. McCall has been appointed resident engineer of the Texas Central, with jurisdiction between Waco and Stamford, Tex.

Mr. W. E. Bogart has been appointed chief engineer of the Wichita Valley, with headquarters at Seymour, Tex., to succeed Mr. J. W. Field, resigned.

Mr. C. W. Keyser has been appointed foreman of bridges and buildings of the Chicago, Rock Island & Pacific at Fort Worth, Tex., succeeding Mr. H. Martin, resigned.

Mr. Douglass P. Morrison has been appointed electrical engineer of the Pittsburg & Lake Erie, with office at Pittsburg, Pa., succeeding Mr. G. M. Campbell, who resigned several months ago.

Mr. Byron Layton has been appointed engineer of maintenance of way of the Chicago, Indiana & Southern, with office at Hammond, Ind. Mr. W. R. Sanborn, assistant engineer has resigned.

Mr. W. L. Darling, chief engineer of the Northern Pacific, has been appointed vice-president of the Portland & Seattle, also in charge of construction, with headquarters at Saint Paul, Minn.

Mr. Arthur Ridgeway has been appointed acting engineer of bridges and buildings of the Denver & Rio Grande, with offices at Denver, Colo., succeeding Mr. W. A. Morey, who resigned some time ago.

Mr. Paul A. Hartung has resigned as resident engineer of the Indianapolis Southern at Bloomfield, Ind., and has been appointed locating engineer of the Union Pacific, with headquarters at Omaha, Neb.

Roadway Painting and Beautification

Usually the painting of bridges and buildings along the roadway does not come under the jurisprudence of the mechanical department, but is entrusted to some of the roadway departments, with the result, that in the latter case, they are sometimes seriously neglected, for the reason that the work is generally entrusted to some incompetent painter.

It once fell to our lot to paint an iron structure that had formerly been "cared" for by the roadway department, and it cost about seventy-five dollars to remove the rust and scale, in order to get it in a fit condition for painting, and for applying the paint the cost was only about ten dollars. Had this work been properly performed in the first instance, and regularly painted thereafter, the seventy-five dollars expended for cleaning could have been saved for the company, to say nothing of the weakened condition of the structure caused by the accumulations of rust, which for the most part was more than an eighth of an inch in thickness, and could be removed only with a hammer. The work had been looked after and often repainted by an inexperienced painter, who had neglected the structure until the appearance of rust warned him that painting was necessary, and which he proceeded to do, not once, but many times, without removing any of the rust, with the result as above stated. The above instance is a parallel case with many others where this work is not under the care of the mechanical department. We recall another similar instance only more aggravated. The steel bridges on a certain road had been "cared for" by the roadway department in a manner similar to the case mentioned above, until their condition became alarming. An expert bridge builder was called in to pass upon their safety, with the result that they were all condemned, and it became necessary to replace them with new ones. These instances are a most forceful argument against the short-sighted policy of some railroads in limiting the jurisdiction of the foreman painter so as to render wasteful negligence possible, as in the instances stated above. Every road of five hundred miles and upwards should have a general foreman painter, with jurisdiction covering the roadway work.

The principal points to be considered in maintaining steel bridges are a suitable paint, preparation of the metal, a favorable season for painting, and a sufficient quantity of paint at each painting. Owing to the fact that there is always more or less water to be found under all bridges, and a consequent steady evaporation of moisture therefrom enveloping the structure, extra care of such structure is rendered necessary in order to prevent the ravages of rust, which, if it once begins, is like the camel entering the tent. Rust should never be permitted to make its appearance on a bridge; it should be well painted before it leaves the works, and as soon as it is placed in position it should again be painted in order to protect all bare places occurring from abrasions, of which there will necessarily be many, then, if it is annually painted with one or two coats of suitable paint, rust may be prevented indefinitely. Another essential point affecting the durability of such structures is the rusting at all points of contact. The specifications should provide that such points should be painted with a thick paint before the parts are assembled or the rivets driven.

But, regardless of the volume of advice that is given as to the best and most economical method of maintaining such structures, there will be many instances of neglect, and rust in vast quantities will be found, and such must be dealt with as circumstances will best admit. In such cases the first necessary step is to remove the rust, and in the absence of a sand blast or other mechanical means, a wire brush, steel scraper and chipping hammer will complete the outfit of tools most available for this purpose. With these the rust should be entirely removed, and the painting should follow closely before the metal again rusts, but no paint should be applied in the early morning before the moisture has dried out of the pores, for the reason that sealed up moisture will work untold injury later on, with the result that somebody's paint will in all probability have to stand the blame, or else some painter's reputation for ability will sustain a severe shock.

After the metal has been prepared the question of a suitable paint is next in order. Of the various kinds, such as carbon, oxide, graphite and red lead, that are most used for this purpose, circumstances should determine the kind most suitable to meet the exigencies of the case; if the structure is subjected to much water or moisture, then red lead is rather to be preferred, for the reason that it causes the oil to dry harder than any other pigment with which it could be mixed, and, therefore, forming an impervious coating, provided enough coats are applied, which on bare iron should be at least three coats. A serious objection to red lead, however, is that, owing to its specific gravity being greater than that of linseed oil, it is difficult to apply it so that it will not streak and sag; this can be prevented in various ways, one of which is to mix with it a certain proportion of some pigment of lighter density, such as carbon or oxide, thereby decreasing its specific gravity sufficiently for the oil to sustain it. Another objection to red lead is that it dries so hard that it soon becomes brittle unless submerged in water; this can be obviated to some extent by adding a small proportion of cottonseed oil, about one part, and two parts linseed oil. For structures not subjected to much water or moisture, either a carbon or oxide would be preferable to red lead, provided enough of it is applied to form a coating sufficiently thick to repel moisture, but it is a mistake to apply one or two thin coats of any kind of paint and then neglect it until rust makes its appearance. There is a famous bridge in Scotland, the painting of which furnishes a fitting example of the proper method of caring for such costly structures. The painting of this bridge consumes just one year, and when the work is completed, the workmen immediately begin at the starting point to apply another coat; in this way it is annually painted, and no rust is allowed to make its appearance.

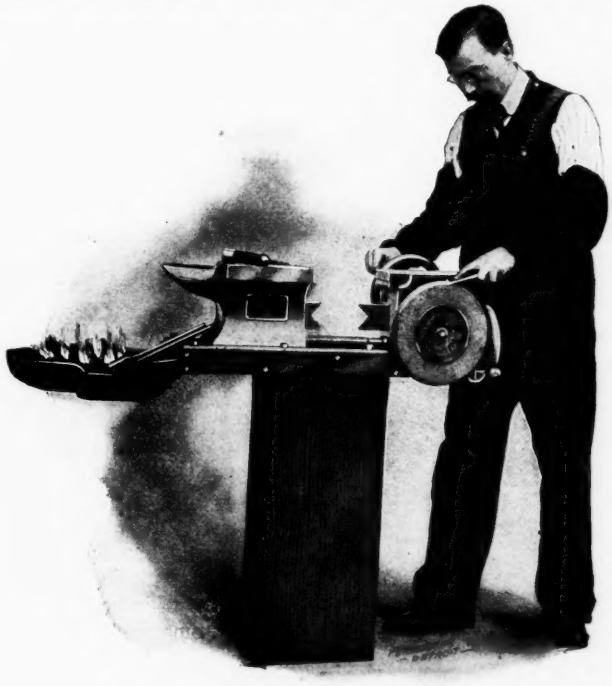
In painting the depots along railways it is a rare thing to see any taste displayed; usually such buildings are painted some dark unattractive color, which gives them an extremely barn-like appearance. It would cost but little, if any, more to paint them in bright harmonious colors, and this would likely be done were this work under the supervision of some practical painter of executive ability. In painting such buildings due consideration should be given to selection of paints most suitable for this

purpose, as the sulphur gases from coal smoke are particularly antagonistic to blues and yellows, causing them to fade badly. Any of the natural pigments are much better for this purpose than those chemically produced.

Another matter of great importance in beautifying the roadway is the custom in vogue on some roads of cultivating choice flowers, tastefully arranged at or near the depots and prominent crossings. In some instances this is so extensive as to take the form of landscape gardening, and is no small advertisement for the road, as the traveling public has a keen appreciation of such efforts on the part of the company to make such provision for their pleasure, moreover, flowers are suggestive; they represent the highest attributes of human nature. An incident of the Civil War which confirms this fact may not be amiss just here, although it is a digression. A detachment of soldiers had become separated from their regiment, and during their wanderings were forced to rely upon the hospitality of the residents for subsistence and they noted the fact that wherever flowers were cultivated tehre was to be found the greater hospitality. Wherever flowers are planted about the depot, the building should be painted in colors that harmonize with the surroundings. In this way the one is naturally helpful to the other, and the most impressive effect is attained.

Detroit Combination Tool.

The combination tool as shown in the accompanying illustration is without a doubt the best of its kind. In fact there is no piece of machinery of equal size which will perform as many different kinds of work as this tool is capable of. The Detroit Combination tool can be used for drilling, for forge work, as can be readily noted in the illustration with the anvil, forge and rotary blower apparatus. Again the tool has other capabilities, as the ordinary vise, a pipe vise, and an emery wheel. For drilling the anvil serves as a tail stock while the mechanism on



DETROIT COMBINATION TOOL

the other end to which the emery wheel is attached serves as the head stock. With each complete tool a crucible holder, twist drill and blacksmith tongs are furnished. For catalogue and further details address the Detroit Tool Co., Detroit, Mich.

The Archer Railway Coal Charging Barrow.

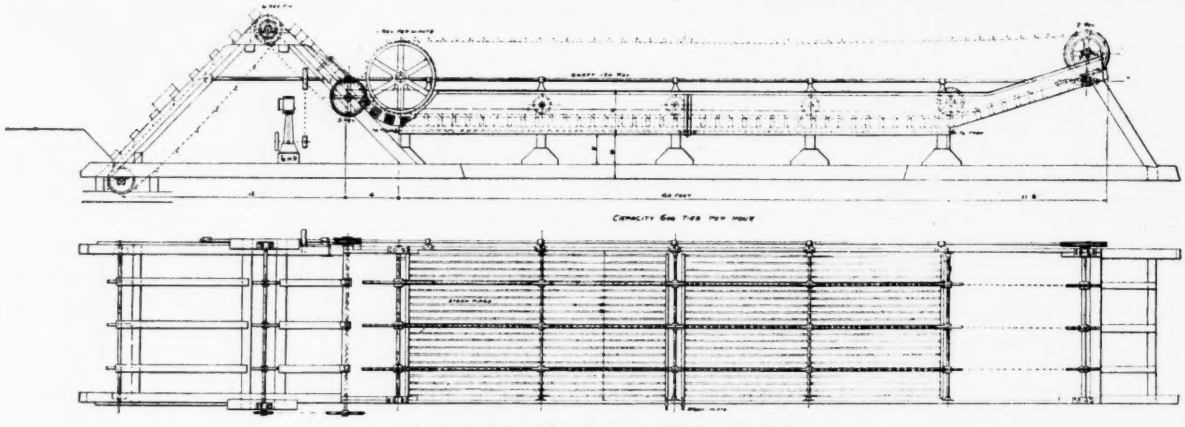
There are many places on railroads where the coaling of an engine is not sufficiently frequent to necessitate the installing of a regular coaling station. The usual method being to detail several section men to shovel the coal into the tender. By this method much valuable time is lost both for the labor and the

THE ARCHER COAL CHARGING BARROW

holding of the engine. The Archer Iron Works, of Chicago, Ill., is at present manufacturing a high grade charging barrow for just such work. With this scheme several barrows can be previously loaded at convenient times and on the arrival of the engine can be quickly dumped into the tender with a great saving of time. The barrow itself is 9 ft. long, 30 in. wide, and 30 in. deep. The sides are No. 12 steel and the bottom No. 10. The axle is 2 in.x 2 in. with 4 in. drops, the wheels being of special construction of wrought iron with ¾ in. round spokes. The third point of support is a 9 in. swivel wheel. One man can easily handle a ton of coal in one of these barrows. For illlustrated booklet and prices address Archer Iron Works, Chicago, Ill.

Carbolineum Wood Preservative.

The remarkable increase in the use of wood preservatives in late years is due no doubt to the excellent results that have been noted by their use in actual hard service. No more severe test could hardly be found than in wooden structure work along the coasts. In one place where the preservative known as "Avenarius Carbonlineum" has been used, on the wooden structure of the Desdemonia Lighthouse Station, Mouth of Columbia River, Oregon, after five years service, the timber has been found to be entirely free from moss, fungus and barnacles. Many other places can be mentioned of the successful use of the above preservative. The tie treating plant which has a capacity of 600 ties per hour is shown in the accompanying illustration. For prices and illustrated booklet showing further use of this preservative address the Carbonlineum Wood Preserving Co., 128 Reed St., Milwaukee, Wis.



CARBOLINEUM TIE TREATING PLANT

Miscellany

The Buda Foundry & Manufacturing Co., of Chicago has opened a branch house in St. Louis and established a warehouse in that city to expedite shipments of orders originating in that territory. The new branch will be in charge of Mr. W. E. Marvel, who was formerly one of the traveling representatives of the company.

The Southern Railway will spend about $5,500,000 on improvements in the neighborhood of Chattanooga, Tenn. An important part of the work is the tunnel through Lookout mountain. Two-thirds of this has been completed, and the balance is to be finished in ten months. There is also a draw-bridge over the Tennessee river; double-track work between Ooltewah and Chattanooga, 15 miles, and a new passenger station and terminal.

The tie preserving plant of the Missouri, Kansas & Texas Ry., at Greenville, Tex., has been remodeled and put into condition for working the Rueping creosote process and the straight creosote process. This plant has heretofore been used for the zinc-tannin process. The Gray Tie Co., at Evansville, Ind., is building a two-retort plant to treat ties with the Wellhouse process. The plant is being so constructed that two more retorts can be added later on. Mr. S. M. Rowe, consulting engineer, Monadnock Bldg., Chicago, has charge of the construction work of these plants.

A new coaling plant of the Pennsylvania Railroap at Denholm, Pa., was recently completed by the Pittsburg Construction Co., and put into service. The same company is building a similar plant at Thorndale for the Pennsylvania, and this will be ready for use in a short time. These plants are of a new type, and are almost ientrely of cement construction over steel. Facilities are provided at each plant for five engines to take coal, water and sand and to dump ashes at one time. The Denholm plant has already been shown to be of great service in facilitating freight movements on the middle division.

It is stated that the Florida East Coast Railway Co., the Boston & Florida Land Co., the Coast Line Canal & Transportation Co. and the Model Land Co. are arranging for the reclamation of about 8000 acres of fertile overflowed lands near West Palm Beach, Fla., and the building of an automobile and wagon road several miles long. A canal will be cut from the submerged lands emptying into Lake Worth, along the side of which will be built a country road 25 ft. wide. A system of dykes will also be constructed on Clear Lake, about a mile south of the city, running three to four miles, on which will be built a modern roadway.

The extensive improvements being made to the lake terminals of the Baltimore & Ohio at Lorain, Ohio, will be completed within a few weeks, thus greatly enlarging the facilities at that point. All the improvements are of most modern design, and Mr P. Farrell, of Cincinnati, Ohio, is the contractor. They include a ten-stall brick roundhouse; machine shop; blacksmith shop and boiler room; oil and store house, 30x50 ft.; gravity coal tipple and sand house, the coal tipple having a capacity for 360 tons and the sand house being able to take care of 16 cars of wet sand and 37 tons of dry sand; double track storage ash pit, 86 ft. long. This pit is so arranged as to store two days' supply of ashes, which can be removed by a locomotive crane and automatic grab bucket and loaded in cars either ahead of or behind the crane; trainmen's building, 35x50 ft., arranged with offices for the general foreman and clerks; and toilet rooms on the first floor for the workmen, enginemen and trainmen. On the second floor are located reading, lounging and sleeping rooms for the enginemen and trainmen. There is also a kitchen and lunch room in the basement.